

# 435-JEBE-TURNITIN

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## Bankruptcy Prediction Model: Altman (Z-Score), Springate (S-Score), Zmijewski (X-Score) And Grove (G-Score) Models in Companies Listed at The LQ 45 Stock Index

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### ABSTRACT

The research was conducted using the Altman Z-score method, Springate, Zmijewski and Grove to analyze bankruptcy. The study was conducted on the LQ 45 stock index, for the 2020-2022 period, a sample of 28 companies was based on a purposive sampling technique. The research method uses explanatory with investigative descriptive. The results of the four bankruptcy prediction models show that the majority of companies are in good health.

Keywords: Altman, springate, zmijewski, grove, bankruptcy, LQ 45

### INTRODUCTION

Before making investments, investors and creditors typically evaluate a company's financial well-being by examining its inclusion in the LQ45 index group. The financial reports of companies listed in the LQ45 exhibit favorable indicators, suggesting optimistic prospects for growth. Certain companies can maintain their position in the LQ45 index for prolonged durations.

The criteria for including stocks in the calculation of the LQ45 index are as follows: 1. The corporation has been officially registered on the Indonesia Stock Exchange for a minimum duration of three months. 2. It currently ranks within the top 60 stocks regarding transaction value within the regular market. The LQ45 index calculation incorporates thirty stocks with the highest value, while regular market transactions, transaction frequency, and market capitalization determine the assessment of the remaining fifteen stocks. Maintaining a position in the LQ45 index is challenging for companies, given that the selection process takes place biannually and is contingent upon pre-established criteria. If a company's stocks fail to satisfy the stipulated criteria, they are delisted from the LQ45 index.

Barito Pacific Tbk/ BRPT, a conglomerate operating in the petrochemical and energy industries, experienced exclusion from the LQ45 index from 2020 to 2021. Nevertheless, it is worth noting that the BRPT made a reappearance in the LQ45 index during the period spanning from February to July 2022. The alteration above was prompted by the ramifications of the COVID-19 pandemic, which reached its zenith in the years 2020 and 2021. This phenomenon exemplifies the ability of companies to exit and subsequently re-enter the LQ45 index during periods of stock stabilization or growth.

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The study by Mochamad Kohar Mudzakar (Journal of Economics and Business Sciences) investigates the practical application of the Altman Z-Score method in predicting corporate bankruptcy. The study conducted by Ben Moch, Dzulkrirom AR Topowijono, and published in the Accounting and Finance Journal aimed to examine the effectiveness of the Springate (S-score) method in predicting bankruptcy among real estate and property companies listed on the Indonesian Stock Exchange from 2011 to 2013.

According to the research conducted by Ifida Maya Arista and published in the Economics & Business Journal, the study titled "Analysis of the Modified Altman Z-Score Method in Predicting Bankruptcy in LQ45 Companies" reveals that in the year 2019, a total of 15 companies were identified as financially sound, while three companies fell within the ambiguous range. Two companies were deemed to be at risk of bankruptcy. In the year 2020, thirteen companies were deemed to be in a healthy financial state, three companies were classified as uncertain, and four companies were identified as having a high risk of bankruptcy. In the year 2021, a total of 14 financially stable companies, two companies with uncertain financial standing and four at risk of bankruptcy, were observed. The research conducted by Risma Dwi Nurminawati in the Economics and Business Journal was centered around the prediction of bankruptcy based on share prices. Various models, such as the Altman Z-Score, Zmijewski, and G-Score, were utilized.

In light of the dynamic fluctuations observed in the LQ45 index, corporations and investors must undertake a comprehensive assessment of the likelihood of bankruptcy prior to making investment decisions. The researcher expresses interest in conducting a study titled "An Analysis of Bankruptcy Prediction Utilizing the Altman (Z-score), Springate (S-score), Zmijewski (X-score), Grove (G-score) Model in Companies Listed on the LQ45 Stock Index" based on the provided background information.

## LITERATUR REVIEW

### Financial Report

A financial report comprehensively represents a company's financial status and operational performance during a specific timeframe or over a designated period. The balance sheet, profit and loss statement, cash flow report, and statement of changes in financial position are among the frequently encountered financial reports (Harahap, 2015, p. 105).

### Financial Ratio Analysis

The analysis of financial ratios is a fundamental tool used in assessing a company's financial performance and health. By examining the relationships between various financial figures, such as liquidity,

Financial statement analysis is a valuable tool used to assess a company's performance by examining and comparing financial data from various sections of a financial report. Financial ratios link different components within a financial report, encompassing elements from diverse assets, liabilities, equities, and balance sheet items in conjunction with components from the profit and loss statement (Sustrisno, 2012, p. 212).

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One method for examining a financial report entails the utilization of ratio analysis. This analysis is employed to ascertain the correlation between the positions identified within a singular financial report or among different positions (Kasmir, 2013, p. 72).

### **Bankruptcy**

According to the provisions outlined in Law No. 4 of 1998, bankruptcy is characterized as a legal state wherein a court ruling designates an entity possessing a minimum of two creditors as bankrupt due to its incapacity to settle at least one outstanding debt that is currently due. Several observable indicators may suggest a business is encountering difficulties and potential financial challenges: There has been a notable decrease in sales or revenue. There is a reduction in both profit and cash flow from operations. There has been a significant decrease in the price of stocks in the stock market. The decrease in the overall value of assets.

There exists a significant probability of encountering failure within the industry or other industries that share comparable levels of risk. Young companies, which often encounter challenges during their initial operational years and lack substantial financial backing, may ultimately face the risk of bankruptcy. According to Lesmana and Surjanto (2014:183-184), there were significant reductions in dividend payments.

### **The Anticipatory Analysis of Financial Distress: A Study on Bankruptcy Prediction**

At present, there exist multiple systems that companies can employ to address the issue of bankruptcy. These systems include the Altman (Z-score), Springate (S-score), Zmijewski (X-score), and Grove (G-score) models.

The model was initially formulated by Edward I. Altman in 1968 and subsequently revised in 1995. The objective of the modification was to mitigate the impact of industry-specific factors by incorporating the asset turnover variable (X5). According to Winarso Eddy and T.C.J Adriandra (2019), after excluding the asset turnover variable, the model becomes applicable for assessing bankruptcy in manufacturing and non-manufacturing firms. In the current study, our empirical analysis focuses on the performance of the Z (Altman).

Metode Altman Z-Score:

$$Z'' = 6,56 X1 + 3,26 X2 + 6,72 X3 + 1,05 X4$$

Information:

Z'': Bankruptcy Index

X1: Working Capital: Total Asset

X2: Retained Earnings: Total Asset

X3: Earning Before Interest and Tax: Total Asset

X4: Book Value of Equity: Total Debt

Classification:

If the Z value" < 1.1: Bankrupt.

1,1 < Z" < 2,6 : Grey area.

Z" > 2,6 : Healthy.

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The Springate model formulates as follows (Prabowo dan Wibowo, 015):

$$S = 1,03 A + 3,07 B + 0,66 C + 0,4 D$$

Where:

A: Working Capital/Total Asset

B: Earnings before Interest and Taxes/Total Asset

C: Earnings before Taxes/Current Liabilities

D: Sales/Total Asset

Clarification:

Score > 0,862 : The company is classified as healthy

0,862 < S < 0,862: Grey Area

Score < 0,862 : The company is in the bankrupt category

The Zmijewski model produces the following formula (Prihanthini dan Sari, 2013):

$$Z = -4,3 - 4,5X1 + 5,7X2 - 0,004X3$$

Where:

X1: ROA (Return On Asset)

X2: Leverage (Debt Ratio)

X3: Likuiditas (Current Ratio)

Klarifikasi:

Score > 0 : The company went bankrupt

If < 0 : The company has the potential not to go bankrupt

Jeffrey S. Grover (2001) produces the following function (Prihanthini and Sari, 2013):

$$\text{Score} = 1,650X1 + 3,404X2 - 0,016ROA + 0,057$$

Where:

X1: Working Capital/Tolal Aset

X2: Earnings before Interest and Taxes/Total Asset

X3: ROA:Net Income/Total Asset

Clarification:

Score < -0,02 : Companies in the bankrupt category

-0,02 < G < 0,01 : Grey Area

Score > 0,01 : Companies in the non-bankrupt category

## METHOD

The study is descriptive in nature to describe and measure corporate bankruptcy (secondary data). The population is the number of companies indexed on LQ45 constantly from 2020 to 2022.

Research sample:

1. Companies listed on the LQ 45 stock index

2. Period 2020-2022 (continuously)

3. Companies other than the financial sector

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**Table 1. List of Company Samples for 2020-2022**

NO	KODE	NAMA PERUSAHAAN
1	ADRO	Adaro Energi Tbk
2	ANTM	Aneka Tambang (persero) Tbk
3	ASII	Astra Internasional Tbk
4	CPIN	Charoen Pokphand Indonesia Tbk
5	ERAA	Erajaya Swasembada Tbk
6	EXCL	XL Axiata Tbk
7	<sup>3</sup> HMSP	H.M Sampoerna Tbk
8	ICBP	Indofood CBP Sukses Makmur Tbk
9	INCO	Vale Indonesia Tbk
10	INDF	Indofood Sukses Makmur Tbk
11	INKP	Indah Kiat Pulp & Paper Tbk
12	INTP	Indocement Tunggul Prakarsa Tbk
13	ITMG	Indo Tambang Raya Megah Tbk
14	JPFA	Japfa Comfeed Indonesia Tbk
<sup>3</sup> 15	KLBF	Kalbe Farma Tbk
16	MDKA	Merdeka Copper Gold Tbk
17	MIKA	Mitra keluarga Karya Sehat Tbk
18	MNCN	Media Nusantra Citra Tbk
19	PGAS	Perusahaan Gas Negara (persero) Tbk
20	PTBA	Tambang Batubara Bukit Asam Tbk
21	SMGR	Semen Indonesia Tbk
22	SMRA	Summarecon Agung Tbk
23	TBIG	Tower Bersama Infrastructure Tbk
24	TLKM	Telekomunikasi Indonesia (persero)

25	TOWR	Sarana Menera Nusantara Tbk
26	UNTR	United Tractors Tbk
27	UNVR	Unilever Indonesia Tbk
28	WIKA	Wijaya Karya (persero) Tbk

Source: [www.idx.co.id](http://www.idx.co.id) (processed)

### Data Analysis Technique

1. Financial reports included in the LQ 45 stock index for three years (2020-2022/ already processed)

2. Counting

Altman Z-score models

$$Z'' = 6.56 X1 + 3.26 X2 + 6.72 X3 + 1.05 X4$$

Score = Results of Altman Model Analysis

X1 = (Current Assets – Current Liabilities): Total Assets

X2 = Retained Earnings: Total Assets

X3 = Profit Before Interest and Tax: Total Assets

X4 = Book Value of Common Stock and Preferred Stock: Book Value of Total Debt

Springate model

$$S = 1.03 A + 3.07 B + 0.66 C + 0.4 D$$

Score = Results of Springate Model Analysis

A = Working Capital/Total Assets

B = Gross Profit/Total Assets

C = Gross Profit/Current Liabilities

D = Sales/Total Assets

Zmijewski model

$$Z = -4.3 - 4.5X1 + 5.7X2 - 0.004X3$$

Score = Result of Zmijewski Model Analysis

X1 ROA: Net Profit/Total Assets

X2: Total Debt/Total Assets

X3: Current Assets/ Current Liabilities

Grove models

$$\text{Score} = 1.650X1 + 3.404X2 - 0.016ROA + 0.057$$

3. Perform interpretation

X1: Working Capital/Total Assets

X2: Earnings before Interest and Taxes/Total Assets

X3: ROA: Net Income/Total Assets

Interpretation of the model:

- Altman

If the Z value "< 1.1: the company is in the bankrupt category.

$1.1 < Z < 2.6$ : A gray area.  
 $Z > 2.6$ : The company is classified as healthy  
 - Springate  
 Score  $> 0.862$ : The company is classified as healthy  
 $0.862 < S < 0.862$ : Gray Area  
 Score  $< 0.862$ : The company is in the bankrupt category  
 - Zmijewski  
 Score  $> 0$ : The company is bankrupt  
 If  $< 0$ : the company has the potential not to go bankrupt  
 - Grove  
 Score  $< -0.02$ : The company is in the bankrupt category  
 $-0.02 < G < 0.01$ : Grey Area  
 Score  $> 0.01$ : Companies in the non-bankrupt category  
 4. Draw conclusions

## RESULTS AND DISCUSSION

Altman, Springate, Zmijewski, Grove model bankruptcy prediction

**Tabel 2. Nilai Penghitungan Model Altman Z-score**

NO	CODE	YEAR	S-SCORE	PREDICTION
1	ADRO	2020	0,488	Bankrupt
		2021	1,732	Healthy
		2022	3,056	Healthy
2	ASII	2020	0,713	Bankrupt
		2021	0,888	Healthy
		2022	1,096	Healthy
3	ANTM	2020	0,699	Bang
		2021	0,973	Healthy
		2022	1,213	Healthy
4	CPIN	2020	1,747	Healthy
		2021	1,603	Healthy
		2022	1,279	Healthy



5	ERAA	2020	1,806	Healthy
		2021	2,375	Healthy
		2022	1,671	Healthy
6	EXCL	2020	-0,006	Bankrupt
		2021	0,085	Bankrupt
		2022	0,111	Bankrupt
7	HMSP	2020	2,378	Healthy
		2021	1,924	Healthy
		2022	2,359	Healthy
8	ICBP	2020	1,306	Healthy
		2021	0,929	Healthy
		2022	1,108	Healthy
9	INCO	2020	3,914	Healthy
		2021	5,620	Healthy
		2022	6,260	Healthy
10	INDF	2020	0,795	Bankrupt
		2021	0,784	Bankrupt
		2022	0,857	Bankrupt
11	INKP	2020	0,690	Bankrupt
		2021	0,855	Healthy
		2022	1,154	Healthy
12	INTP	2020	1,089	Healthy
		2021	1,069	Healthy
		2022	1,057	Healthy
13	ITMG	2020	1,190	Healthy

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		2021	3,158	Healthy
		2022	4,604	Healthy
14	JPFA	2020	1,180	Healthy
		2021	1,444	Healthy
		2022	1,158	Healthy
15	KLBF	2020	2,108	Healthy
		2021	2,167	Healthy
		2022	2,056	Healthy
16	MDKA	2020	0,529	Bankrupt
		2021	0,626	Bankrupt
		2022	0,336	Bankrupt
17	MIKA	2020	2,546	Healthy
		2021	2,877	Healthy
		2022	2,525	Healthy
18	MNCN	2020	1,598	Healthy
		2021	1,907	Healthy
		2022	1,777	Healthy
19	PGAS	2020	0,434	Bankrupt
		2021	0,892	Healthy
		2022	0,965	Healthy
20	PTBA	2020	1,443	Healthy
		2021	2,421	Healthy
		2022	2,783	Healthy
21	SMGR	2020	0,531	Healthy
		2021	0,491	Healthy

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		2022	0,536	Healthy
22	SMRA	2020	0,315	Bankrupt
		2021	0,485	Bankrupt
		2022	0,434	Bankrupt
23	TBIG	2020	0,144	Bankrupt
		2021	0,219	Bankrupt
		2022	0,260	Bankrupt
24	TLKM	2020	0,979	Healthy
		2021	1,078	Healthy
		2022	0,902	Healthy
25	TOWR	2020	0,575	Bankrupt
		2021	0,136	Bankrupt
		2022	0,310	Bankrupt
26	UNTR	2020	0,918	Healthy
		2021	1,265	Healthy
		2022	1,728	Healthy
27	UNVR	2020	2,441	Healthy
		2021	2,174	Healthy
		2022	2,156	Healthy
28	WIKA	2020	0,172	Bankrupt
		2021	0,118	Bankrupt
		2022	0,172	Bankrupt
	2020K	Healthy		16
		<i>Grey area</i>		0
		Bankrupt		12

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		<b>Amount</b>	28
	2021	Healthy	21
		<i>Grey area</i>	0
		Bankrupt	7
		<b>Amount</b>	28
	2022	Healthy	21
		<i>Grey area</i>	0
		Bankrupt	7
		<b>Amount</b>	28

Source: Financial Report (processed)

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The Altman Z-score is a financial metric developed by Edward Altman in 1968. It is used to assess the financial

In the year 2020, a total of 23 companies were classified as healthy, two companies fell into the grey area category, and three companies declared bankruptcy. In the year 2021, a total of 23 companies were classified as healthy, while one company fell into the grey area, and four companies declared bankruptcy. In the year 2022, a total of 23 companies were classified as healthy, while one fell into the grey area, and four companies declared bankruptcy.

**Table 3. Springate S-score model calculation values**

NO	CODE	YEAR	S-SCORE	PREDICTION
1	ADRO	2020	0,488	Bankrupt
		2021	1,732	Healthy
		2022	3,056	Healthy
2	ASII	2020	0,713	Bankrupt
		2021	0,888	Healthy
		2022	1,096	Healthy
3	ANTM	2020	0,699	Bang
		2021	0,973	Healthy

		2022	1,213	Healthy
4	CPIN	2020	1,747	Healthy
		2021	1,603	Healthy
		2022	1,279	Healthy
5	ERAA	2020	1,806	Healthy
		2021	2,375	Healthy
		2022	1,671	Healthy
6	EXCL	2020	-0,006	Bankrupt
		2021	0,085	Bankrupt
		2022	0,111	Bankrupt
7	HMSP	2020	2,378	Healthy
		2021	1,924	Healthy
		2022	2,359	Healthy
8	ICBP	2020	1,306	Healthy
		2021	0,929	Healthy
		2022	1,108	Healthy
9	INCO	2020	3,914	Healthy
		2021	5,620	Healthy
		2022	6,260	Healthy
10	INDF	2020	0,795	Bankrupt
		2021	0,784	Bankrupt
		2022	0,857	Bankrupt
11	INKP	2020	0,690	Bankrupt
		2021	0,855	Healthy
		2022	1,154	Healthy

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12	INTP	2020	1,089	Healthy
		2021	1,069	Healthy
		2022	1,057	Healthy
13	ITMG	2020	1,190	Healthy
		2021	3,158	Healthy
		2022	4,604	Healthy
14	JPFA	2020	1,180	Healthy
		2021	1,444	Healthy
		2022	1,158	Healthy
15	KLBF	2020	2,108	Healthy
		2021	2,167	Healthy
		2022	2,056	Healthy
16	MDKA	2020	0,529	Bankrupt
		2021	0,626	Bankrupt
		2022	0,336	Bankrupt
17	MIKA	2020	2,546	Healthy
		2021	2,877	Healthy
		2022	2,525	Healthy
18	MNCN	2020	1,598	Healthy
		2021	1,907	Healthy
		2022	1,777	Healthy
19	PGAS	2020	0,434	Bankrupt
		2021	0,892	Healthy
		2022	0,965	Healthy
20	PTBA	2020	1,443	Healthy

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		2021	2,421	Healthy
		2022	2,783	Healthy
21	SMGR	2020	0,531	Healthy
		2021	0,491	Healthy
		2022	0,536	Healthy
22	SMRA	2020	0,315	Bankrupt
		2021	0,485	Bankrupt
		2022	0,434	Bankrupt
23	TBIG	2020	0,144	Bankrupt
		2021	0,219	Bankrupt
		2022	0,260	Bankrupt
24	TLKM	2020	0,979	Healthy
		2021	1,078	Healthy
		2022	0,902	Healthy
25	TOWR	2020	0,575	Bankrupt
		2021	0,136	Bankrupt
		2022	0,310	Bankrupt
26	UNTR	2020	0,918	Healthy
		2021	1,265	Healthy
		2022	1,728	Healthy
27	UNVR	2020	2,441	Healthy
		2021	2,174	Healthy
		2022	2,156	Healthy
28	WIKA	2020	0,172	Bankrupt
		2021	0,118	Bankrupt

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		2022	0,172	Bankrupt
	2020	Healthy		16
		Gray area		0
		Bankrupt		12
		<b>Amount</b>		28
	2021	Healthy		21
		Gray area		0
		Bankrupt		7
		<b>Amount</b>		28
	2022	Healthy		21
		Gray area		0
		Bankrupt		7
		<b>Amount</b>		28

Source: Financial Report (processed)

Springate (S-score)

Year 2020: Healthy: 16 companies; Gray area:0 ; Bankrupt: 12 companies. Year 2021: Healthy: 21 companies; Gray area: 0; Bankrupt: 7 companies. Year 2022: Healthy: 21 companies; Gray area:0; Bankrupt 7 companies.

**Table 4. Zmijewski X-score Model Calculation Values**

NO	CODE	YEAR	S-SCORE	PREDICTION
1	ADRO	2020	-2,247	Healthy
		2021	-2,567	Healthy
		2022	-3,240	Healthy
2	ASII	2020	-2,147	Healthy
		2021	-2,265	Healthy
		2022	-2,407	Healthy



3	ANTM	2020	-2,188	Healthy
		2021	-2,469	Healthy
		2022	-3,137	Healthy
4	CPIN	2020	-3,435	Healthy
		2021	-3,111	Healthy
		2022	-2,704	Healthy
5	ERAA	2020	-1,767	Healthy
		2021	-2,287	Healthy
		2022	-1,295	Healthy
6	EXCL	2020	-2,739	Healthy
		2021	-2,739	Healthy
		2022	-2,953	Healthy
7	HMSP	2020	-2,857	Healthy
		2021	-2,346	Healthy
		2022	-2,607	Healthy
8	ICBP	2020	-1,721	Healthy
		2021	-1,562	Healthy
		2022	-1,676	Healthy
9	INCO	2020	-0,459	Healthy
		2021	-1,410	Healthy
		2022	-2,321	Healthy
10	INDF	2020	-1,632	Healthy
		2021	-1,652	Healthy
		2022	-1,794	Healthy
11	INKP	2020	-1,559	Healthy

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		2021	-1,897	Healthy
		2022	-2,324	Healthy
12	INTP	2020	-3,531	Healthy
		2021	-3,414	Healthy
		2022	-3,269	Healthy
13	ITMG	2020	-2,922	Healthy
		2021	-4,005	Healthy
		2022	-4,867	Healthy
14	JPFA	2020	-1,326	Healthy
		2021	-1,555	Healthy
		2022	-1,193	Healthy
15	KLBF	2020	-3,791	Healthy
		2021	-3,907	Healthy
		2022	-3,808	Healthy
16	MDKA	2020	-2,195	Healthy
		2021	-2,197	Healthy
		2022	-1,658	Healthy
17	MIKA	2020	-4,209	Healthy
		2021	-4,432	Healthy
		2022	-4,379	Healthy
18	MNCN	2020	-3,616	Healthy
		2021	-4,032	Healthy
		2022	-4,330	Healthy
19	PGAS	2020	-0,971	Healthy
		2021	-1,321	Healthy

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		2022	-1,586	Healthy
20	PTBA	2020	-3,072	Healthy
		2021	-3,437	Healthy
		2022	-3,510	Healthy
21	SMGR	2020	-1,526	Healthy
		2021	-1,832	Healthy
		2022	-2,155	Healthy
22	SMRA	2020	-0,728	Healthy
		2021	-1,159	Healthy
		2022	-1,083	Healthy
23	TBIG	2020	-0,184	Healthy
		2021	-0,106	Healthy
		2022	-0,220	Healthy
24	TLKM	2020	-1,931	Healthy
		2021	-2,144	Healthy
		2022	-2,147	Healthy
25	TOWR	2020	-0,671	Healthy
		2021	0,118	Bankrupt
		2022	-0,094	Healthy
26	UNTR	2020	-5,062	Healthy
		2021	-5,116	Healthy
		2022	-5,107	Healthy
27	UNVR	2020	-1,542	Healthy
		2021	-1,253	Healthy
		2022	-1,164	Healthy

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28	WIKA	2020	-0,021	Healthy
		2021	-0,051	Healthy
		2022	0,066	Bankrupt
	2020	Healthy		28
		Gray area		0
		Bankrupt		0
		<b>Amount</b>		28
	2021	Healthy		27
		Gray area		0
		Bankrupt		1
		<b>Amount</b>		28
	2022	Healthy		27
		Gray area		0
		Bankrupt		1
		<b>Amount</b>		28

Source: Financial Report (processed)

Zmijewski (X-score)

Year 2020: Healthy: 28 companies; gray area: 0; broke:0. Year 2021: Healthy: 27 companies; gray areas: 1; bankrupt: 0. Year 2022: Healthy: 27 companies; gray area:0; broke: 1.

**Table 5. Calculation value of the Grover G-score model**

NO	CODE	YEAR	G-Score	PREDICTION
1	ADRO	2020	0,269	Healthy
		2021	0,985	Healthy
		2022	1,905	Healthy
2	ASII	2020	0,502	Healthy
		2021	0,609	Healthy

		2022	0,712	Healthy
3	ANTM	2020	0,315	Healthy
		2021	0,629	Healthy
		2022	0,863	Healthy
4	CPIN	2020	0,950	Healthy
		2021	0,862	Healthy
		2022	0,682	Healthy
5	ERAA	2020	0,631	Healthy
		2021	0,786	Healthy
		2022	0,510	Healthy
6	EXCL	2020	-0,210	Gray area
		2021	-0,163	Gray area
		2022	-0,086	Gray area
7	HMSP	2020	1,627	Healthy
		2021	1,243	Healthy
		2022	1,302	Healthy
8	ICBP	2020	0,567	Healthy
		2021	0,553	Healthy
		2022	0,579	Healthy
9	INCO	2020	3,717	Healthy
		2021	5,095	Healthy
		2022	5,573	Healthy
10	INDF	2020	0,422	Healthy
		2021	0,457	Healthy
		2022	0,509	Healthy

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11	INKP	2020	0,666	Healthy
		2021	0,755	Healthy
		2022	0,979	Healthy
12	INTP	2020	0,811	Healthy
		2021	0,769	Healthy
		2022	0,709	Healthy
13	ITMG	2020	0,842	Healthy
		2021	1,948	Healthy
		2022	2,868	Healthy
14	JPFA	2020	0,641	Healthy
		2021	0,798	Healthy
		2022	0,642	Healthy
15	KLBF	2020	2,108	Healthy
		2021	2,167	Healthy
		2022	2,056	Healthy
16	MDKA	2020	0,277	Healthy
		2021	0,443	Healthy
		2022	0,259	Healthy
17	MIKA	2020	1,335	Healthy
		2021	1,492	Healthy
		2022	1,175	Healthy
18	MNCN	2020	1,013	Healthy
		2021	1,139	Healthy
		2022	1,027	Healthy
19	PGAS	2020	0,315	Healthy

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		2021	0,559	Healthy
		2022	0,592	Healthy
20	PTBA	2020	0,820	Healthy
		2021	1,518	Healthy
		2022	1,767	Healthy
21	SMGR	2020	0,287	Healthy
		2021	0,420	Healthy
		2022	0,464	Healthy
22	SMRA	2020	0,350	Healthy
		2021	0,539	Healthy
		2022	0,456	Healthy
23	TBIG	2020	-0,051	Gray area
		2021	0,005	Gray area
		2022	0,048	Healthy
24	TLKM	2020	0,371	Healthy
		2021	0,454	Healthy
		2022	0,316	Healthy
25	TOWR	2020	0,190	Healthy
		2021	-0,097	Gray area
		2022	0,016	Healthy
26	UNTR	2020	0,740	Healthy
		2021	1,054	Healthy
		2022	1,403	Healthy
27	UNVR	2020	0,849	Healthy
		2021	2,218	Healthy

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		2022	5,085	Healthy
28	WIKA	2020	0,163	Healthy
		2021	0,071	Healthy
		2022	0,141	Healthy
2020		Healthy		26
		Gray area		2
		Bankrupt		0
		<b>Amount</b>		<b>28</b>
2021		Healthy		25
		Gray area		3
		Bankrupt		0
		<b>Amount</b>		<b>28</b>
2022		Healthy		27
		Gray area		1
		Bankrupt		0
		<b>Amount</b>		<b>28</b>

Source: Financial Report (processed)

#### Grove (G-score)

Year 2020: Healthy: 26 companies; gray area 2; Bankrupt: 0. Year 2021: Healthy: 25 companies; Gray area: 3 companies; Bankrupt: 0. Year 2022 Healthy: 27 companies; Gray area 1 company; Bankrupt: 0.

### CONCLUSIONS AND RECOMMENDATIONS

#### Conclusion

LQ45 indexed companies for the 2020-2022 period experiencing bankruptcy according to the model: Altman (Z-score), Springate (S-score), Zmijewski (X-score), and Grove (G-Score). The results of the study can be concluded as follows:

1. Altman (Z-score), 2020: healthy 23, a gray area 2, broke 3; 2021: healthy 23, a gray area 1, bench 4; 2022: healthy 23, a gray area 1, broke 4.
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2. Springate (S-score) 2020: healthy 16, a gray area 0, bankrupt 12; 2021: healthy 21, a gray area 0, broke 7; 2022: healthy 21, a gray area 0, broke 7.
3. Zmijewski (X-score) 2020: healthy 28, a gray area 0, bankrupt 0; 2021: healthy 27, a gray area 1, broke 0; 2022 healthy 27, a gray area 0, bankrupt 1.
4. Grove (G-score) 2020: healthy 26, a gray area 2, bankrupt 0; 2021: healthy 25, a gray area 3, broke 0; 2022: healthy 27, a gray area 1, broke 0.

#### Limitations

1. Samples are limited to 2020-2022.
2. The financial data uses the rupiah currency in reporting.

#### Suggestion

Suggestions for companies, investors, and further researchers are:

1. Companies can perform bankruptcy prediction analysis to anticipate problems that will occur.
2. before making investment decisions, investors can use information about financial statement analysis with bankruptcy predictions to minimize risk. It is better to invest in companies that are categorized as healthy.
3. The next researcher adds another model and the research period.

## REFERENCES

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